The Role of Local Materials in Creating A Meaningful Visual Experiences in Urban Public Facilities

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Abstract. This paper discusses visibility potential of local material products that are used as part of architectural spaces. Knowing the visibility potential of local materials is essential to create visual clarity that supports the ease of spatial orientation and navigation and provides a meaningful visual experience in urban public facilities. This study aims at finding the property quality of objects from local materials that contribute to the visibility potential. Field studies were conducted to identify different types of products from local materials and their characteristics associated with the quality of space experience. The visibility analysis using 3D software program then was carried out by simulating the placement of objects as elements of space in a particular spatial configuration. The result reveals several patterns of possible placement of objects from local materials that have the best potential to enhance visibility. These patterns can add to the alternative vocabulary in architectural design. *Keywords: visibility potential, local material, visibility analysis, visual experience.*

1 Introduction

Local materials have been widely used as part of architectural space for several reasons. The use of local material has been mostly associated with the issue of sustainability and ecological aspect. Some studies have discussed the use of local materials concerning the use of energy [1,2,3,4,5]. Other study discussed the use of local materials in creating thermal comfort in building interior [6,7]. All of these studies emphasize the role of local materials in creating environmental sustainability. Related with the aesthetic aspect, the use of local materials in a traditional and contemporary building can also enhance the visual look of the building by displaying the strong local character of the building. It usually reflects the environmental condition of the place where the building is located, thus reveal the identity space.

This paper tries to propose another idea of using the local materials as a part of architectural space in public building by emphasizing on the visibility potential of local materials. This study aims to find the property quality of objects from local materials that contribute to its visibility potential. Local materials usually have the salient feature that creates contrast compared to other contemporary material. This saliency is one of the factors that make object has the potential to be more visible, attractive, thus easier to remembered [8]. A salient object is important to be used as landmarks, the point of references that play essential roles in building navigation or wayfinding.

In this study, the object of local material will be put as part of interior space. This paper will discuss the visibility of objects of local materials that are placed in some decision points in a corridor of a building. Decision points are points in circulation space where people likely need a cue to guide them which direction to take [9]. By a simulation approach, we will try to find out the relation between the placement of objects, the distance of the observer and the level of visibility of object as a result. We intend to use the visibility potential of local material as cues to create an imageable space that “heightens the potential depth and intensity of human spatial experience” [10].

2 Method

This paper was based on a study of local material from field survey at some workshops on clay, as one of the local materials that are still easily found and used in Central Java, Indonesia. From the data collected we identified types and characteristics of objects produced from local material. The visual characteristics of these objects were recorded, consisting of shape, color, texture. Their possible application as the element of space was also noted, including wall, floor, ceiling or standalone object.

A visibility analysis by simulation then was conducted. The object of local material was assumed as part of architectural space. As for setting models, some different space configurations that represent decision points in indoor public space were composed. Different

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spatial forms had been indicated to produce different wayfinding behavior [9]. This paper will only show the result of the simulation at one of the decision point space configuration, the T- shape closed corridor with 2.4 m wide.

The placement of an object, as one of the factors that could affect the visibility of object become the variable of study. In this paper, the object of study is placed on three locations on the wall as a 1.2 m rectangular plane that stretched from the floor up to the ceiling. This plane represented any form and kind of placement of the object of local material applied to the wall. The first and second location is on one side of the wall at the end of the corridor A, and the second one is on the wall that exactly at the intersection of corridor A and B.

The visibility study from 6 different locations of the observer was conducted to see how the observer will see each object. The observer was assumed to stand in the center of each corridor, with three different distances from the intersection of the corridors. The visibility was assumed to be seen from the frontal view from two different angles of view, 30 degrees and 60 degrees. The 30 degrees range is the human angle of view that to see and distinguish shapes, while 60 degrees range is the angle of view to see and distinguish color. The image of the view from each simulation was captured using Rhinoceros 3D, and the visible regions were calculated using MatLab. Table 1. shows 12 simulations conducted in this study.

Table 1. The visibility study simulations

No	Codes	Corridor	Position	Angle of view
1	A1.30	A	1	30°
2	A2.30		2	30°
3	A3.30		3	30°
4	A1.60		1	60°
5	A2.60		2	60°
6	A3.60		3	60°
7	B1.30	B	1	30°
8	B2.30		2	30°
9	B3.30		3	30°
10	B1.60		1	60°
11	B2.60		2	60°
12	B3.60		3	60°

3 Result

3.1 Object of local materials

Figure 1. Examples of local material objects as wayfinding cues

Clay is one of the local materials that are still widely used in Indonesia. Indonesia has different kind of soil that made it has a rich variety of clay and objects that can be produced from this material. From the field studies to some workshops on clay products in Central Java, we find out four types of objects produced from

clay. They are bricks, roof tile, terracotta tile, and pottery. Each type of objects has many variants depending on the locations of its origin. Table 2 shows the type of objects from clay, their characteristics, and possible applications.

Table 2. Types of objects from clay

Types of objects	Visual Characteristics	Possible application
Brick	Modular object; Rectangular volume with 6 surfaces of display Color: yellowish brown, reddish brown (varied) Texture: smooth to coarse	Exposed wall with variety pattern of installation (exterior and interior)
Roof tile	Modular object ; Rectangular plane with 1 surface of display Color: orange, reddish brown, dark brown (varied) Texture: smooth, curvy surface	Roof coverings (exterior) ; Part of wall coverings with variety pattern of installation (interior)
Terra cotta tile	Modular object ; Rectangular and square plane with 1 surface of display Color: Terracotta Texture: smooth, patterned texture (varied)	Part of wall coverings with variety pattern of installation (interior) Floor covering (interior and exterior)
Pottery	Single/stand-alone object (vase, barrel, etc) Variety of shape, color, texture	Artwork applied on wall or stand-alone object in space (interior and exterior)

3.2 The visibility of objects

The visibility of an object was measured from corridor A and B. On each corridor the observer was placed on three positions. 4.8 m back from the end of the corridor, 2.4 m back from the end of the corridor and right on the end line of the corridor. The angles of view were 30 degrees and 60 degrees.

The visibility of objects from 30 degrees angle of view on corridor A can be seen in Table 3. The table informs us that the broadest region area for the wall with local material was obtained when the observer stands on position A3 (nearest to the front wall). However, the observer on position A2 and A3 can only see one object. The objects on two different locations can occur in the observer's view if the observer sees it from position A1 (furthest to the corridor's end).

Table 3. The visibility of objects from 30 degrees angle of view on corridor A

Code	Sub Code	Element	Area	Percentage
A1.30				
	A1.30.1	Left wall	38848	13%
	A1.30.2	Ceiling	53950	18%
	A1.30.3	Left Wall with local material	25056	8%
	A1.30.4	Front wall (left part)	33248	11%
	A1.30.5	Floor	13088	4%
	A1.30.6	Front wall with local material	34314	12%
	A1.30.7	Front wall (right part)	32983	11%
	A1.30.8	Right wall	63437	22%

		TOTAL	294924	100%
A2.30
	A2.30.1	Ceiling	28588	9.53%
	A2.30.2	Front wall (left part)	90237	30.07%
	A2.30.3	Front wall (right part)	94080	31.35%
	A2.30.4	Front wall with local material	87167	29.05%
		TOTAL	300072	
A3.30
	A3.30.1	Front wall (left part)	48138	10.88%
	A3.30.2	Front wall with local material	211721	47.84%
	A3.30.3	Front wall (right part)	41650	9.41%
		TOTAL	442537	100%

The visibility of objects from 30 degrees angle of view on corridor B can be seen in Table 4. The visibility of an object in corridor B gave a different result. At position B1 and B2, the observer can see local material on the wall in both locations. However, at position B3 the observer cannot see any object of local material.

Table 4. The visibility of objects from 30 degrees angle of view on corridor B

Code	Sub Code	Element	Area	Percentage
B1.30
	B1.30.1	Left wall (near)	64917	13%
	B1.30.2	Ceiling	61404	18%
	B1.30.3	Floor	27469	8%
	B1.30.4	Front left wall with local material	16373	11%
	B1.30.5	Left wall (far)	9926	4%
	B1.30.6	Front corridor	19323	12%
	B1.30.7	Right wall (far)	12758	11%
	B1.30.8	Right wall with local material	9874	22%
	B1.30.9	Right wall (near)	72142	24,52%
		TOTAL	294186	100%

B2.30
	B2.30.1	Ceiling	66908	22.59%
	B2.30.2	Front left wall with local material	56397	19.04%
	B2.30.3	Left wall (far)	28217	9.53%
	B2.30.4	Floor	22695	7.66%
	B2.30.5	Front corridor	29580	9.99%
	B2.30.6	Right wall (far)	36019	12.16%
	B2.30.7	Right wall with local material	35936	12.13%
	B2.30.8	Right wall (near)	20400	6.89%
		TOTAL	296152	100%
B3.30
	B3.30.1	Left wall (far)	89118	29.90%
	B3.30.2	Ceiling	55179	18.52%
	B3.30.3	Floor	15940	5.35%
	B3.30.4	Front corridor	49219	16.52%
	B3.30.5	Right wall (far)	88561	29.72%
		TOTAL	298017	100%

The visibility of objects from 60 degrees angle of view on corridor A can be seen in Table 5. At 60 degree angle of view, the observer can have a broader view. At all positions, the observer can see the object of local material. Position A1 and A2 made the observer see two locations of the object, whereas at position A3 only one location of the object can be seen.

Table 5. The visibility of objects from 60 degrees angle of view on corridor A

Code	Sub Code	Element	Area	Percentage
A1.60
	A1.60.1	Left wall	1275	0.43%
	A1.60.2	Left wall with local material	69510	23.49%
	A1.60.3	Ceiling	62861	21.24%
	A1.60.4	Left wall	15844	5.35%
	A1.60.5	Floor	29086	9.83%
	A1.60.6	Left wall with local material	6439	2.18%
	A1.60.7	Front wall (left part)	6840	2.31%
	A1.60.8	Front wall with local material	6840	2.31%

	A1.60.9	Front wall (right part)	6840	2.31%
	A1.60.10	Right wall	90384	30.54%
		TOTAL	295919	100%
A2.60
	A2.60.1	left wall with local material	71495	50.70%
	A2.60.2	Ceiling	63394	44.95%
	A2.60.3	Front wall (left part)	23296	16.52%
	A2.60.4	Floor	31680	22.46%
	A2.60.5	Front wall with local material	16198	11.49%
	A2.60.6	Front wall (right part)	23478	16.65%
	A2.60.7	Right wall	69672	49.40%
		TOTAL	141028	
A3.60
	A3.60.1	Ceiling	61473	20.54%
	A3.60.2	Front wall (left part)	89043	29.75%
	A3.60.3	Front wall with local material	61359	20.50%
	A3.60.4	Front wall (right part)	87435	29.21%
	TOTAL		299310	

The visibility of objects from 60 degrees angle of view on corridor B can be seen in Table 6. At 60 degrees angle of view, the observer can see all the two objects on all the position (B1, B2, B3). The region area for the wall with local material varies from 1,85 % (B1.60.8) to 42,69 % (B3.60.2)

Table 6. The visibility of objects from 60 degrees angle of view on corridor B

Code	Sub Code	Element	Area	Percentage
B1.60
	B1.60.1	Left wall (near)	93491	90.23%
	B1.60.2	Ceiling	63452	61.24%
	B1.60.3	Floor	31485	30.39%
	B1.60.4	Front left wall with local material	3179	3.07%
	B1.60.5	Left wall (far)	2173	2.10%
	B1.60.6	Front corridor	4095	3.95%
	B1.60.7	Right wall (far)	2662	2.57%

	B1.60.8	Right wall with local material	1914	1.85%
	B1.60.9	Right wall (near)	94938	91.63%
		TOTAL	103609	100 %
B2.60
	B2.60.1	Left wall (near)	69421	65.84%
	B2.60.2	Ceiling	65670	62.28%
	B2.60.3	Floor	34748	32.96%
	B2.60.4	Front left wall with local material	15737	14.93%
	B2.60.5	Left wall (far)	5997	5.69%
	B2.60.6	Front corridor	6240	5.92%
	B2.60.7	Right wall (far)	8018	7.60%
	B2.60.8	Right wall with local material	10747	10.19%
	B2.60.9	Right wall (near)	80435	76.29%
		TOTAL	105440	100%
B3.60
	B3.60.1	Ceiling	71791	52.26%
	B3.60.2	Front left wall with local material	58638	42.69%
	B3.60.3	Left wall (far)	29023	21.13%
	B3.60.4	Floor	28839	20.99%
	B3.60.5	Front corridor	10608	7.72%
	B3.60.6	Right wall (far)	48726	35.47%
	B3.60.7	Right wall with local material	49195	35.81%
	TOTAL		137368	

4 Discussion

The study shows that the visibility of objects will be influenced by distance and angle of view. At different distances (4.8 m, 2.4 m and right on the end line of the corridor), the wall with the local material will be seen differently. Some studies of visibility also shown from where an object can be visible to the observer [11,12]. This study showed not only where an object can be visible by the observer, but also how visible the object is by measuring the region area using MatLab.

This study also shows how spatial configuration took part in enabling the object to be visible. At the T-shape intersection corridor where one of the corridors stops,

being in the other corridor can give a possibility to see more object on the wall. Walking to approach the end of the corridor where the corridors intersect, will give a focus to only one location of the object, that is at the front view. The effect of spatial configuration on mobile visibility had been discussed before by James Gibson [13]. Gibson argued that every configuration of place constitutes a vista. So, when one moves in a corridor that at the end intersects with another corridor, it will make him close the vista behind and open up the vista ahead. The wall at the end of the corridor makes an occluding edge that will hide any vista on the front. However, as an observer move ahead approaching the intersection, the hidden vista will be opened up.

5 Conclusion

In measuring the visibility of objects, the configuration of space should be taken into consideration. In this initial study, a simple plan of a corridor is used as a setting. Further study should be conducted by including more detailed elements. This study also considers the objects of local material in their basic shape. More specific characteristics of an object can be added to generate a more comprehensive result.

Local materials produce a variety of objects that will relate to how these objects can be applied in indoor space and how these objects have the visibility potential. In adding elements of local materials as indoor landmarks within the circulation space, it is important to consider the configuration of space, since it will affect the visibility of object at a certain point.

Acknowledgments

This publication is supported by the United States Agency for International Development (USAID) through the Sustainable Higher Education Research Alliance (SHERA) Program for Universitas Indonesia's Scientific Modeling, Application, Research, and Training for City-centered Innovation and Technology (SMART CITY) Project, Grant #AID-497-A-1600004, Sub Grant #IIE-00000078-UI-1.

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